REMARKS

Claims 1-48 are pending in the application.

Applicant notes with appreciation that the Examiner has indicated that claims 39-42 contain subject matter allowable over the prior art.

Claims 1-34 and 43-47 are rejected under 35 U.S.C. § 102(b) as being unpatentable over Lim et al. U.S. patent 6,026,108 (hereinafter "Lim").

Claims 35-38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lim.

Reconsideration of this application in view of the following remarks is respectfully requested.

Applicant's Reply to the
Rejections Under 35 U.S.C. § 102(b)

The Examiner rejected claims 1-34 and 43-47 under 35 U.S.C. § 102(b) as being unpatentable over Lim. In particular, the Examiner rejected claim 27* contending that Lim discloses a light emitting element 20 disposed on a substrate 22 with an impedance network (50Ω,C,L) also disposed on the substrate and coupled to the light emitting element (Office Action, page 2, section 3). Applicant respectfully disagrees. Nonetheless, applicant has amended

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* In the Office Action, claim 26 is rejected for the reasons stated above. However, applicant believes the Examiner intended to reject claim 27 instead as all of the rejected features appear in claim 27 and not in claim 26.

claim 27 to recite an adjustable impedance network to make clear the claimed inventions are not shown or suggested by the prior art.

Light emitting elements such as vertical cavity surface emitting lasers (VCSELs) and the like are used today in a wide variety of electronic applications. Common examples of products that employ light emitting elements include DVD players and high speed optical communications systems. The role of light emitting elements often involves the generation of light pulses for acquiring or transmitting data. To function in this capacity, driver circuitry is used to supply the appropriate electrical differential across the light emitting element to generate digital optical signals.

Many light emitting elements, however, are fabricated with varying impedance values. A VCSEL, for example, typically has an impedance value that varies between about 17-50 Ohms. This variation poses problems for driver circuitry because of the likely impedance mismatch that results between the output of the driver circuitry and the input of the VCSEL. Foremost among these problems are the signal reflections that occur along the transmission line between the driver circuit and the VCSEL that reduce signal quality and limit response time.

In the past, this problem has been dealt with by manipulating the operating characteristics of the driver

circuitry. One popular solution, for example, includes the addition of external termination components that absorb reflected energy. This solution is not optimal because it requires system manufacturers to determine the impedance of each light emitting element individually and couple the appropriate compensation components to the driver circuitry. Other popular solutions include the use of precision driver modules that can accommodate an impedance mismatch without losing significant performance. Such systems, however, inevitably sacrifice certain amounts of bandwidth and frequency response.

Applicant's claimed invention solves these and other problems by disposing both an adjustable impedance network and a light emitting element on the same integrated circuit substrate. This arrangement normalizes the impedance of the overall light emitting circuit which reduces or eliminates the need for external damping components and specialized driver circuitry. Thus, using applicants claimed invention, system designers may achieve superior performance using inexpensive, mainstream driver circuits, often without the use of cumbersome external damping networks.

Lim, on the other hand, fails to show or suggest this feature anywhere. For example, the VCSELs depicted in FIGS. 1 and 15-19 of Lim do not show an adjustable impedance circuit (or a resistor) disposed on substrate 22 or anywhere

else. In fact, nowhere in those figures and the associated text is the presence of an adjustable impedance circuit (or a resistor) mentioned or suggested. Accordingly, applicant respectfully submits that any contention to the contrary is unsupported by Lim.

Furthermore, applicant points out that the impedance components shown FIGS. 20, 21 and 31 of Lim are all external components that are not present on VCSEL substrate 22. This is true for several reasons. First, the none of the components shown in FIG. 20 are disposed on a substrate other than device 130 (Lim FIG. 19 and col. 11, lines 9-42). This includes the potentiometer and other bias circuitry shown in FIG. 20. Moreover, the size of the components described by Lim are far too large to be placed on an integrated circuit. For example, the 0.2μF capacitor described at column 15, lines 28-29 would require approximately 200 mm^2 of die space using a typical fabrication process. This is about the size of the entire surface area of the largest chips currently manufactured. Moreover, the 10H inductor described at column 15, line 28, is about eight orders of magnitude (*i.e.*, one hundred million times) larger than a typical chip-based inductor and would require at least several square feet of die space to construct, and thus is much too large for placement on a semiconductor die.

Accordingly, Lim, fails to show or suggest a light emitting element and an adjustable impedance network disposed on a single substrate coupled to one another as specified by claims 1-47. This is also true for the art cited in the IDS filed herewith. These references merely show static matching networks that are incapable of adjustment and fail to teach the significant performance benefits derived from adjusting the characteristics of such networks as specified in applicant's claimed invention (discussed in more detail below).

Claim 48** is allowable over the prior art because it specifies selecting a range of impedance values and providing an impedance circuit disposed on a substrate so that the input impedance of a light emitting component is within the selected range. Applicants therefore respectfully submit that these claims are allowable over the prior art and in a condition for allowance.

Claims 1-26 and 44-47

Claims 1-26 and 44-47 are further allowable over the prior art because these claims specify adjusting a characteristic of the impedance circuit such as transfer function or overall impedance to obtain a desired circuit attribute such as predetermined impedance (claim 1),

** Claim 48 was not specifically commented on by the Examiner in the 2/13/03 Office Action.

impedance matching (claims 15 and 16), and desired frequency or optical response (claim 17 and 44 respectively). None of these features are shown or suggested by the prior art.

Applicant's Reply to the
Rejections Under 35 U.S.C. § 103(a)

The Examiner rejected claims 35-38 under 35 U.S.C. § 103(a) as being unpatentable over Lim. These claims are allowable over the prior art for at least the same reasons stated above.

Conclusion

The foregoing demonstrates that claims 1-48 are allowable. Reconsideration and a favorable action are respectfully requested.

I Hereby Certify that this Correspondence is being Deposited with the U.S. Postal Service as First Class Mail in an Envelope Addressed to: COMMISSIONER FOR PATENTS P.O. BOX 2327 ARLINGTON, VA 22202 on March 7, 2003

Signature of Person Signing

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